

REMARKS

This amendment is filed along with a Request for Continued Examination. The application is amended in a manner believed to place it in condition for allowance at the time of the next Official Action.

Claim 4 is cancelled without prejudice, as applicants reserve the right to pursue the subject matter in a divisional application.

Claim 3 is amended.

Claim 5 is new.

Support for the amendment to claim 3 and new claim 5 may be found, for example, at page 4, lines 1-7 and at page 8, lines 10-14.

Claims 3 and 5 remain pending in present application.

The Official Action rejects claim 3 under 35 USC §103(a) as being unpatentable over KUZE et al. U.S. 4,119,761 (KUZE) in view of HUTKIN U.S. 4,088,544 (HUTKIN). This rejection is respectfully traversed.

KUZE is offered for teaching the coating of a metallic substrate with a chromium-containing material and the formation of a chromium oxide passivating layer by subjecting the chromium-containing coating to heat treatment and oxidizing atmosphere. The Official Action recognizes that KUZE does not disclose a surface roughness for the substrate, and solely discloses a

surface roughness formed by the chromium oxide passivating layer, i.e., from 0.05 to 30 microns.

HUTKIN is offered for teaching that the coating layer surface roughness mirrors the surface roughness of the substrate for thin coating layers, and that the substrate surface roughness can be controlled to affect the coating layer surface roughness.

The position of the Official Action is that it would have been obvious to one of ordinary skill in the art to control the surface roughness of the substrate in order to affect the surface roughness of the coating layer and arrive at the claimed substrate surface roughness range.

Claim 3 is now directed to depositing a coating material consisting of chromium onto a metallic material and oxidizing the chromium-coated metallic material to form a passivation film consisting of chromium oxide. Through this process, the claimed invention produces chromium oxide passivation that does not include any oxide film of other metallic material and, as a result, provides excellent corrosion resistance.

KUZE fails to disclose a coating material consisting of chromium that forms a passivation film consisting of chromium oxide after heat treatment. As a preferred embodiment, KUZE discloses a chromium containing coating material formed from chromium alloys, i.e., iron-chromium alloy, nickel-chromium alloy, iron-nickel-chromium alloy, etc., that is applied to a

metal substrate. The chromium alloy coating forms various types of oxides after heat treatment. In another embodiment, KUZE suggests pure chromium plating, but KUZE adds an emissivity-improving agent, e.g., vanadium, titanium, zirconium and niobium, to the surface of a metal substrate so the plating layer is satisfactorily blackened during heating. As a result, the chromium plating and the agent, after heat treatment, form a layer comprising chromium oxide and oxides of the agent.

As a result of the methods used by KUZE, the films are inferior to those formed by the claimed invention. For example, in the preferred coating embodiment, if iron is present and chromium is included more than 35%, sigma layers are formed, which result in a fragile film. Iron oxides generated after heat treatment, significantly reduce the corrosion resistance of the layer formed on top of the metallic material substrate.

Indeed, KUZE fails to suggest producing films without the additional metal oxides. The objective of KUZE is to produce heat radiation material with a high heat property, which is specifically used for heat radiation anodes of electron tubes. For this purpose, KUZE requires an emissivity-improving agent, which forms a metal oxide in addition to any chromium oxide present. Thus, one of ordinary skill in the art would have been discouraged from modifying KUZE so as to solely utilize a coating consisting of chromium and obtain a passivation film consisting of chromium oxide.

HUTKIN cannot remedy these deficiencies of KUZE for reference purposes. HUTKIN is directed to a copper foil for wiring printed circuit boards, as well as how to produce the foil. The objective of HUTKIN is to improve the property of peel-off between copper foil and the carrier board. While HUTKIN may discuss a chromium oxide layer and surface roughness, HUTKIN does not disclose depositing chromium onto a metal substrate and forming a chromium oxide passivation film by heat treatment in an oxidizing atmosphere. Rather, HUTKIN discloses forming the chromium oxide layer by electroplating.

Therefore, the proposed combination fails to teach the features of claim 3, and withdrawal of the rejection is respectfully requested.

As to new claim 5, claim 5 is directed to utilizing an oxidizing atmosphere comprising oxygen diluted by an inert gas. KUZE discloses using air and wet hydrogen. (See, e.g., column 3, lines 30-36). HUTKIN discloses forming a chromium oxide layer via electroplating. (See, e.g., column 4, lines 27-43). Thus, the proposed combination also fails to teach the features of new claim 5.

In view of the above, applicants believe that the present application is in condition for allowance at the time of the next Official Action. Allowance and passage to issue on that basis is respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON



Robert Madsen, Reg. No. 58,543
745 South 23rd Street
Arlington, VA 22202
Telephone (703) 521-2297
Telefax (703) 685-0573
(703) 979-4709

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